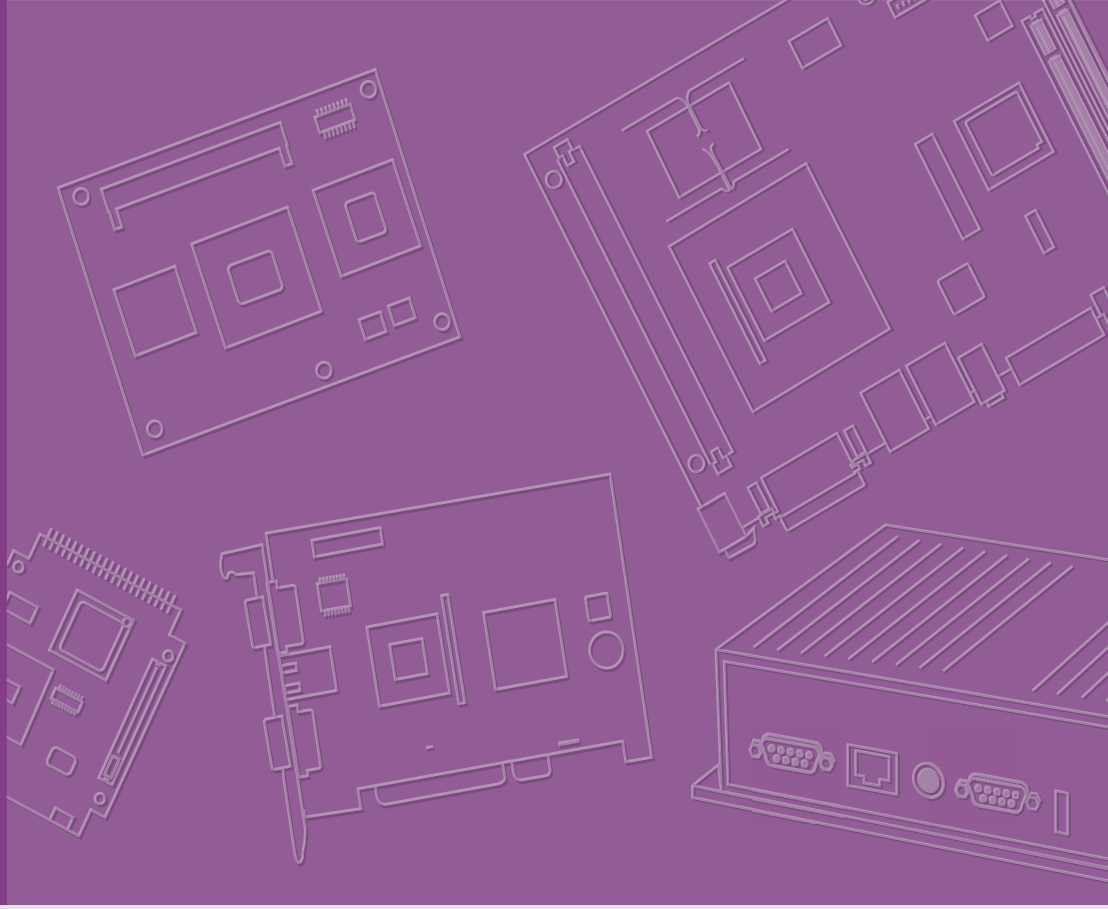

User Manual

UBC-221

Industrial Internet of Things Gateway

ADVANTECH

Enabling an Intelligent Planet

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Part No. 2006U22100 Edition 1

Printed in Taiwan June 2015

Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

FCC Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Technical Support and Assistance

1. Visit the Advantech website at http://support.advantech.com where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*

Caution! *Cautions are included to help you avoid damaging hardware or losing data. e.g.*

There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Note! *Notes provide optional additional information.*

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- 1x UBC-221 unit with Wall mount bracket
- 2x Female connectors for terminal block.

Ordering Information

Model Number	Description
UBC-221CS-GNA1E	Intel Quark x1000 400MHz w/ PoE

Optional Accessories

Model Number	Description
96PSA-A36W12R1	Adaptor 100-240V 36W 12V 3A
1700001524	3-pin USA standard power cord
170203183C	3-pin Europe standard cord
170203180A	3-pin UK standard power cord.

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated into the equipment.
    - The equipment has been exposed to moisture.
    - The equipment does not work well, or you cannot get it to work according to the user's manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.
15. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.
16. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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Chapter 1

General Introduction

This chapter gives background information on UBC-221 series.

1.1 Introduction

The UBC-221 is an Advantech IoT gateway powered by Intel Quark x1000 processor. It is a performance and cost efficient solution for IoT applications. UBC-221 support multiple connections and power over Ethernet.

1.2 Product Features

1.2.1 Key Features

- Intel® Quark x1000 400MHz processor
- Onboard DDR3-800 512MB memory
- Supports UART and GPIO ports
- Supports 2 Gigabit Ethernet and a PoE port
- Supports wallmount bracket for flexible mounting methods
- Low power and fanless design

1.2.2 General

- **CPU:** Onboard Intel Quark x1000 400MHz
- **OS:** Yocto Linux
- **System Memory:** Onboard 512MB DDR3 memory
- **COM Port:** 1 x UART (CTS,RTS,Tx,Rx)
- **USB:** 1 x USB 2.0 Host
- **GPIO:** 2 GPI and 2 GPO
- 2 Green LED for the system power and programmable control.
- **SD slot:** 1 x SD Slot
- **Power input:** +12V DC

1.2.3 Ethernet

- 2 x Gigabit Ethernet ports
- **Speed:** 10/100 Mbps
- **Interface:**
  - 1 x RJ-45 jack with LED
  - 1 x RJ-45 jack with LED and PoE

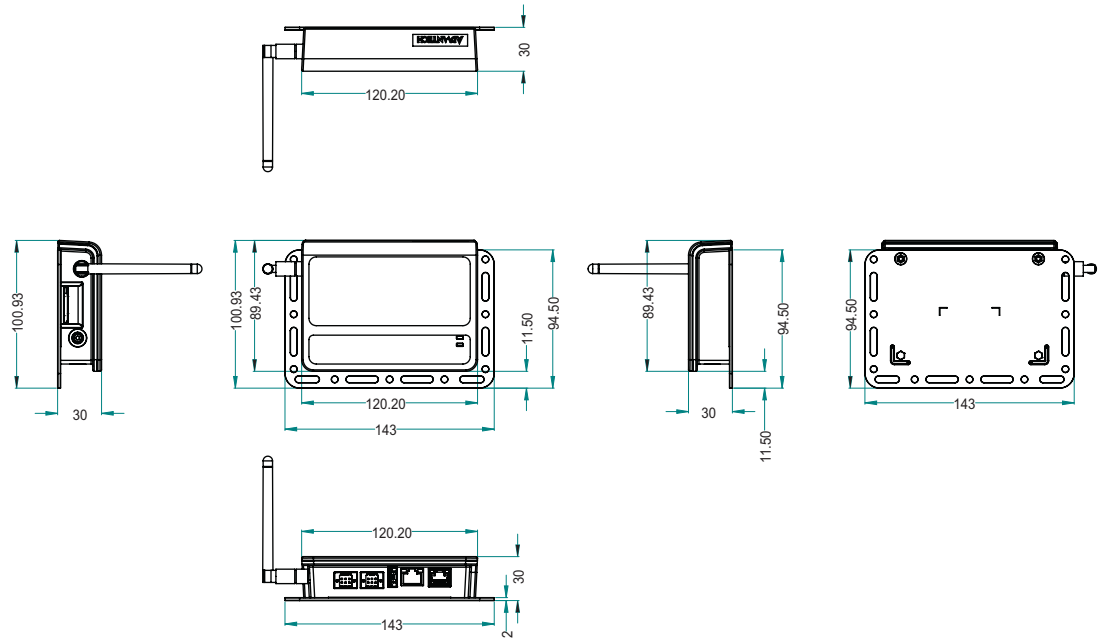
1.2.4 Power Consumption

- **Typical:** 2.16 Watts.
- **Max:** 2.76 Watts.

1.3 Mechanical Specification

1.3.1 Dimensions

- 143 x 101 x 30 mm (L x W x H) with the metal plate
- 120 x 89 x 30 mm without metal plate



1.3.2 Weight

- 200 g (Net weight)

1.4 Power Requirements

1.4.1 System Power

- **Power input:** DC +12V

1.4.2 RTC Battery

- 3 V/240 mAh

1.5 Environment Specifications

1.5.1 Operating Temperature

- 0 ~ 40° C (32 ~ 104° F)

1.5.2 Relative Humidity

- 95% @ 40° C (non-condensing)

1.5.3 Storage Temperature

- -20 ~ 60° C (-4 ~ 104° F)

1.5.4 Vibration Loading during Operation

1.5.5 EMC

- CE, FCC Class B

Chapter 2

Hardware Functionality

This chapter introduces external I/O and explains the setup procedures of the UBC-221 hardware.

2.1 Introduction

The following sections show the external connectors and pin assignments for applications.

2.2 UBC-221 I/O Indication

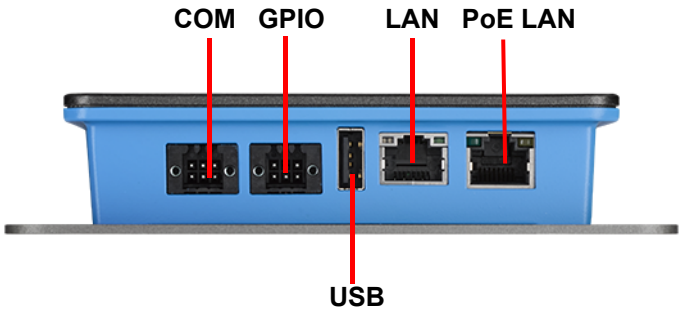


Figure 2.1 UBC-221 front view

Figure 2.2 UBC-221 LED indication

Figure 2.3 UBC-221 left side view

2.3 UBC-221 I/O Connectors

2.3.1 Power Input Connector

The UBC-221 comes with a DC-Jack header that carries 12V DC external power input. The power connector can be fixed by a fastener which is an optional accessory. The fastener avoids power cables falling off.

Figure 2.4 Power input connector

2.3.2 COM Connector

The UBC-221 provides one terminal block 6-pin connector serial communication interface port. The port can support RS-232 mode communication.

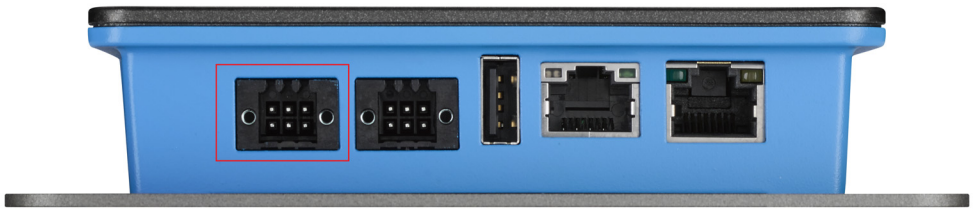


Figure 2.5 COM connector

Table 2.1: COM Connector Pin Assignment

Pin	Description	Pin	Description
1	COM_RTD	2	COM_RTS
3	COM_TXD	4	COM_CTS
5	GND	6	N/C

2.3.3 Ethernet Connector (LAN)

The UBC-221 provides two RJ45 interface connectors. The Ethernet ports are fully compliant with IEEE 802.3x 10/100 and CSMA/CD protocol support. The Ethernet ports provides standard RJ-45 connector with LED indicators on the front side to show Speed/Active status.

LAN: Left is speed (ON-100, OFF-10), Right is Active

PoE: Left is Active, Right is speed (ON-100, OFF-10).

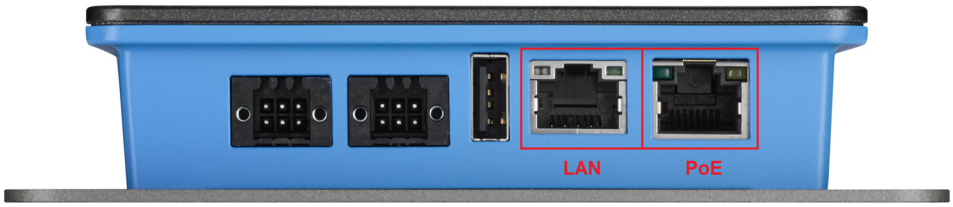


Figure 2.6 Ethernet connector

2.3.4 USB Connector

The UBC-221 uses one USB interface connector that supports high-speed (480 Mbps), full-speed (12 Mbps), and low-speed (1.5 Mbps) operation.

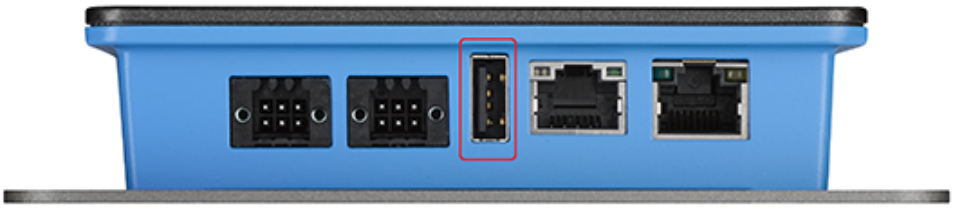


Figure 2.7 USB connector

2.3.5 GPIO Connector

The UBC-221 supports two GPI and two GPO with terminal block interface. The GPI has isolation support so it can protect against unexpected power damage.

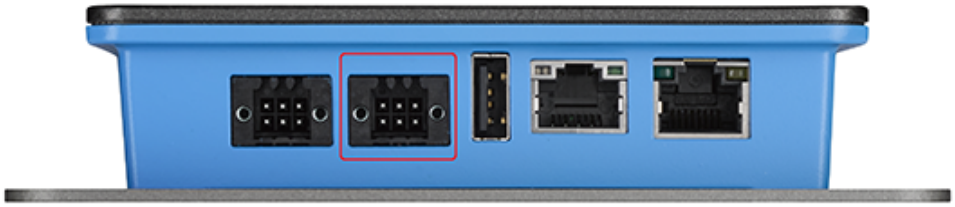


Figure 2.8 GPIO connector

Table 2.2: GPIO Connector Pin Assignment

Pin	Description
1	GPO_0
2	GPI_0
3	GND
4	GND
5	GPO_1
6	GPI_1

2.3.6 SD Connector

UBC-221 provides an SD slot. The SD card is essential for booting up the system and for storage as UBC-221 has no onboard storage.

Figure 2.9 SD connector

Note! *It is recommended to use only "Transcend and Sandisk" SD Cards which Advantech has verified.*

2.4 UBC-221 Hardware Installation

2.4.1 SD Card Installation

1. Remove the power cord.
2. Insert the SD Card directly into UBC-221 from the left side SD slot.

2.4.2 Mini-PCIe Card Installation

1. Unscrew the two screws on the bottom of the case.

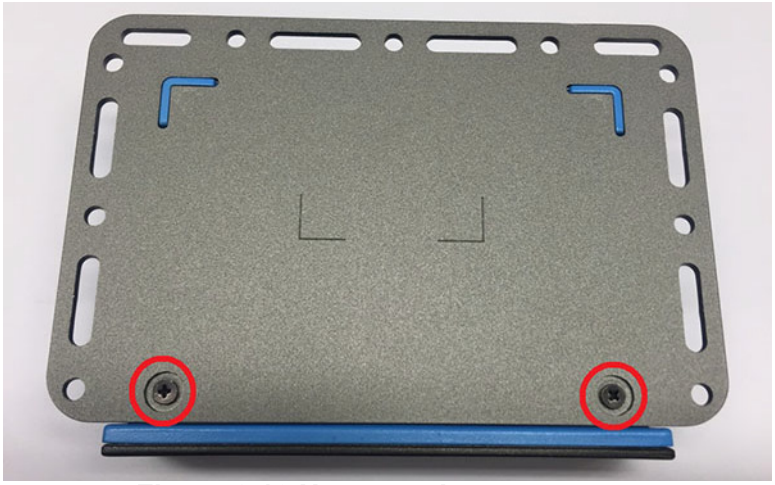
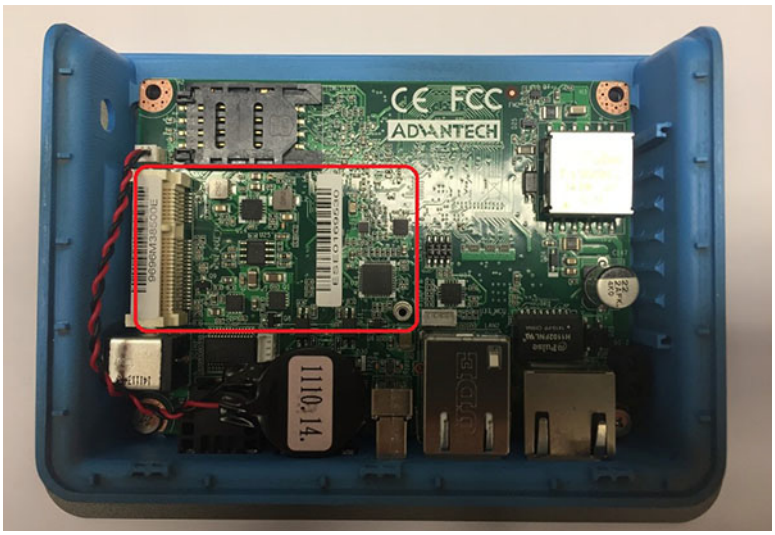


Figure 2.10 Unscrew the two screws

2. Open the top cover.

Figure 2.11 Open the top cover

3. Install your mini-PCIe card, close the top cover and put back the two screws on the bottom of the case.



2.4.3 Console Installation

To install the console cable you must:

1. Unscrew the two screws on the bottom of the case.
2. Open the top cover.
3. Install the console cable, close the top cover and put back the two screws on the bottom of the case as shown in Figure 2.12.

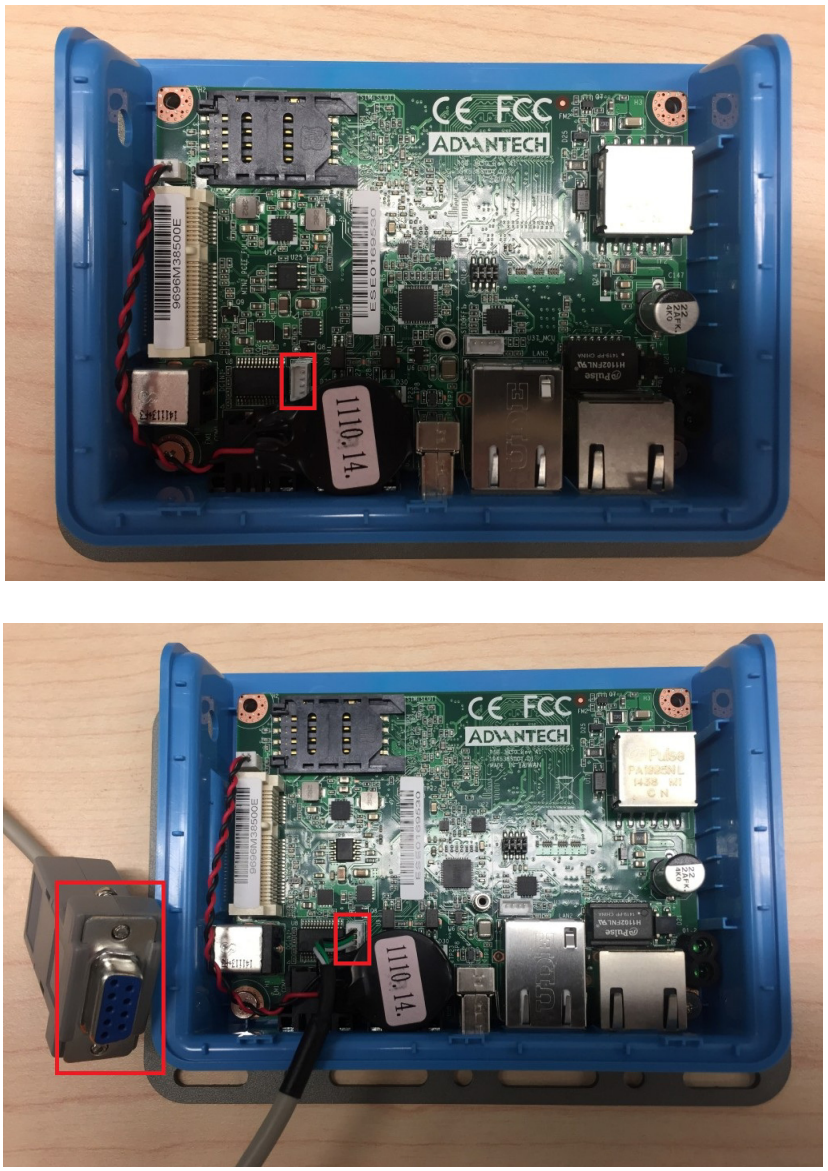


Figure 2.12 Console Installation

2.4.4 Mounting Assembly method

The UBC-221 support flexible wall mounting holes so you can easily fix UBC-221 onto the wall. It also supports a DIN-rail kit (optional) for users who need to mount UBC-221 onto a 35mm DIN-rail.

Chapter 3

Software Functionality

This chapter details the software operating on UBC-221.

3.1 Test tools

All test tools must be verified on UBC-221, please prepare required test fixtures before verifying each specified I/O. If you have any problems getting the test fixture, please contact your Advantech contact window for help.

3.2 Debug Port Setting

UBC-221 can communicate with a host server (Windows or Linux) by using serial cables. Common serial communication programs such as HyperTerminal, Tera Term or PuTTY can be used in this case. The example as below describes the serial terminal setup using HyperTerminal on a Windows host:

1. Connect UBC-221 with your Windows PC by using a serial cable.
2. Open HyperTerminal on your Windows PC, and select the settings as shown in Figure 3.1.

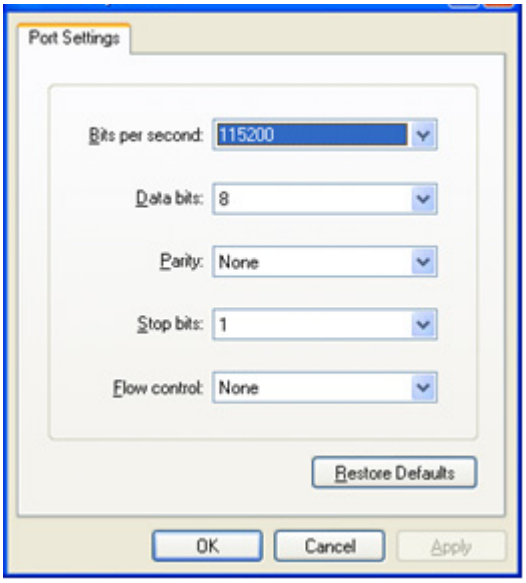


Figure 3.1 Debug port setting

3. After the bootloader is programmed on the SD card, plug in the power cord to power up UBC-221. The bootloader prompt will be displayed on the terminal screen.

3.3 GPIO

```
# echo 0 > /sys/class/gpio/export
# echo 1 > /sys/class/gpio/export
# echo 2 > /sys/class/gpio/export
# echo 3 > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio0/direction
# echo "out" > /sys/class/gpio/gpio1/direction
# echo "in" > /sys/class/gpio/gpio2/direction
# echo "in" > /sys/class/gpio/gpio3/direction
# grep "" /sys/class/gpio/gpio{0..3}/direction
```

3.3.1 Connecting #0 and #3

```
# echo 0 > /sys/class/gpio/gpio0/value
# grep "" /sys/class/gpio/gpio{0,3}/value
```

```
# grep "" /sys/class/gpio/gpio{0..3}/direction
/sys/class/gpio/gpio0/direction:out
/sys/class/gpio/gpio1/direction:out
/sys/class/gpio/gpio2/direction:in
/sys/class/gpio/gpio3/direction:in
```

```
# echo 1 > /sys/class/gpio/gpio0/value
# grep "" /sys/class/gpio/gpio{0,3}/value
```

```
# echo 0 > /sys/class/gpio/gpio0/value
# grep "" /sys/class/gpio/gpio{0,3}/value
/sys/class/gpio/gpio0/value:0
/sys/class/gpio/gpio3/value:0
```

3.3.2 Connecting #1 and #2

```
# echo 0 > /sys/class/gpio/gpio1/value
# grep "" /sys/class/gpio/gpio{1,2}/value
```

```
# echo 0 > /sys/class/gpio/gpio1/value
# grep "" /sys/class/gpio/gpio{1,2}/value
/sys/class/gpio/gpio1/value:0
/sys/class/gpio/gpio2/value:0
```

```
# echo 1 > /sys/class/gpio/gpio1/value
# grep "" /sys/class/gpio/gpio{1,2}/value
```

```
# echo 1 > /sys/class/gpio/gpio1/value
# grep "" /sys/class/gpio/gpio{1,2}/value
/sys/class/gpio/gpio1/value:1
/sys/class/gpio/gpio2/value:1
```

3.4 UART

```
# stty -F /dev/ttyS0 -echo
# cat /dev/ttyS0 &
# echo "1234567890" > /dev/ttyS0
```

3.4.1 Connecting #Tx and #Rx

```
# echo "1234567890" > /dev/ttyS0
```

```
# stty -F /dev/ttyS0 -echo
# cat /dev/ttyS0 &
[1] 1318
# echo "1234567890" > /dev/ttyS0
#
# #Connecting #Tx with #Rx
# echo "1234567890" > /dev/ttyS0
# 1234567890
```

3.5 LED

```
# echo 15 > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio15/direction
```

3.5.1 LED on

```
# echo 1 > /sys/class/gpio/gpio15/value
```

3.5.2 LED off

```
# echo 0 > /sys/class/gpio/gpio15/value
```

```
# echo 15 > /sys/class/gpio/export
# echo "out" > /sys/class/gpio/gpio15/direction
# #LED on
# echo 1 > /sys/class/gpio/gpio15/value
# #LED off
# echo 0 > /sys/class/gpio/gpio15/value
```

3.6 Wifi

Make Intel wifi card for example.
Intel Centrino Wireless-N 135
Model:135BNHMW

set wifi ssid to environment variable, SSID
set wifi password to environment variable, PSWD

```
# ifconfig wlan0 up
# wpa_passphrase $SSID $PSWD > /tmp/wpa.conf
# wpa_supplicant -BDwext -iwlan0 -c/tmp/wpa.conf
# udhcpc -b -i wlan0
# ifconfig
# ping tw.yahoo.com
```

```
wlan0     Link encap:Ethernet  HWaddr 0C:D2:92:57:DA:23
          inet addr:192.168.1.57  Bcast:0.0.0.0  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:17 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2648 (2.5 KiB)  TX bytes:1572 (1.5 KiB)

# ping tw.yahoo.com
PING tw.yahoo.com (116.214.12.74): 56 data bytes
64 bytes from 116.214.12.74: seq=0 ttl=52 time=3.425 ms
64 bytes from 116.214.12.74: seq=1 ttl=52 time=3.359 ms
64 bytes from 116.214.12.74: seq=2 ttl=52 time=3.312 ms
```

3.7 LAN eth0

Make sure the DHCP service works in the connected LAN.

Remove network connection from both of the two LAN ports.

```
# ifconfig eth1 down
# ifconfig eth0 up
# ifconfig
```

```
# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:13:20:FD:F4:F2
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:322 (322.0 B)
          Interrupt:40 Base address:0x4000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

Plug the network cable into the LAN port eth0 and wait for the "eth0: link to show up.

```
# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:13:20:FD:F4:F2
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:322 (322.0 B)
          Interrupt:40 Base address:0x8000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

# [  104.140198] libphy: stmmac-1:01 - Link is Up - 100/Full
[  104.145653] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
```

Checking if there is an IP or not.

```
# ifconfig
```

```
# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:13:20:FD:F4:F2
          inet addr:172.22.12.217  Bcast:172.22.15.255  Mask:255.255.252.
          inet6 addr: fe80::213:20ff:fefd:f4f2/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:4378 errors:0 dropped:1052 overruns:0 frame:0
          TX packets:40 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:401042 (391.6 KiB)  TX bytes:4243 (4.1 KiB)
          Interrupt:40 Base address:0x8000
```

If there is no IP, please check the network connection and DHCP service.
If there is an IP, that means the network is working.
Using Ping to test network connection again.

```
# ping 172.22.15.145
PING 172.22.15.145 (172.22.15.145): 56 data bytes
64 bytes from 172.22.15.145: seq=0 ttl=64 time=2.404 ms
64 bytes from 172.22.15.145: seq=1 ttl=64 time=1.194 ms
64 bytes from 172.22.15.145: seq=2 ttl=64 time=1.385 ms
64 bytes from 172.22.15.145: seq=3 ttl=64 time=1.353 ms
64 bytes from 172.22.15.145: seq=4 ttl=64 time=1.392 ms
^C
--- 172.22.15.145 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 1.194/1.545/2.404 ms
```

3.8 LAN eth1

Make sure the DHCP service works in the connected LAN.

Remove network connection from both of the two LAN ports.

```
# ifconfig eth0 down
# ifconfig eth1 up
# ifconfig
```

```
# ifconfig
eth1      Link encap:Ethernet  HWaddr 02:FF:FF:FF:FF:01
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:938 (938.0 B)
          Interrupt:41 Base address:0xc000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

Plugging the network cable into LAN port eth1 and waiting for "eth1: link to become ready" and show up.

```
# ifconfig
eth1      Link encap:Ethernet  HWaddr 02:FF:FF:FF:FF:01
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:938 (938.0 B)
          Interrupt:41 Base address:0xc000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

# [  484.590197] libphy: stmmac-2:01 - Link is Up - 100/Full
[  484.595641] IPv6: ADDRCONF(NETDEV_CHANGE): eth1: link becomes ready
```

Checking if there is an IP or not.

```
# ifconfig
```

```
# ifconfig
eth1      Link encap:Ethernet  HWaddr 02:FF:FF:FF:FF:01
          inet addr:172.22.12.251  Bcast:172.22.15.255  Mask:255.255.252.0
          inet6 addr: fe80::ff:ffff:feff:ff01/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:7232 errors:0 dropped:1598 overruns:0 frame:0
          TX packets:51 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:655315 (639.9 KiB)  TX bytes:5179 (5.0 KiB)
          Interrupt:41 Base address:0xc000
```

If there is no IP, please check network connection and DHCP service.

If there is one IP, that means network is working.

Using ping to test network connection again.

```
# ping 172.22.15.145
PING 172.22.15.145 (172.22.15.145): 56 data bytes
64 bytes from 172.22.15.145: seq=0 ttl=64 time=2.623 ms
64 bytes from 172.22.15.145: seq=1 ttl=64 time=1.392 ms
64 bytes from 172.22.15.145: seq=2 ttl=64 time=1.354 ms
64 bytes from 172.22.15.145: seq=3 ttl=64 time=1.258 ms
```

3.9 USB

Removing any USB devices.

Plug in one USB storage device with filesystem(fat32,ext2 or ext3). The following message will show up and the file system will be mounted automatically.

```
# df
Filesystem           1K-blocks      Used Available Use% Mounted on
rootfs                  302183    144136    142687  50% /
none                    247980         4    247976   0% /dev
/dev/mmcblk0p1         7838720    311328   7527392   4% /media/realroot
/dev/loop0              302183    144136    142687  50% /
/dev/mmcblk0p1         7838720    311328   7527392   4% /media/mmcblk0p1
tmpfs                   248960       124    248836   0% /var/volatile
tmpfs                   248960         0    248960   0% /media/ram
# [ 2079.780169] usb 2-1: new high-speed USB device number 5 using ehci-pci
[ 2080.150243] usb-storage 2-1:1.0: Quirks match for vid 058f pid 6387: 400
[ 2080.158994] scsi3 : usb-storage 2-1:1.0
[ 2081.182893] scsi 3:0:0:0: Direct-Access     JetFlash TS1GJFV30       8.07 PQ: 0 ANSI: 2
[ 2081.211808] sd 3:0:0:0: [sda] 1986558 512-byte logical blocks: (1.01 GB/969 MiB)
[ 2081.235436] sd 3:0:0:0: Attached scsi generic sg0 type 0
[ 2081.249283] sd 3:0:0:0: [sda] Write Protect is off
[ 2081.259179] sd 3:0:0:0: [sda] No Caching mode page present
[ 2081.264830] sd 3:0:0:0: [sda] Assuming drive cache: write through
[ 2081.287804] sd 3:0:0:0: [sda] No Caching mode page present
[ 2081.293467] sd 3:0:0:0: [sda] Assuming drive cache: write through
[ 2081.304938]  sda: sda1
[ 2081.326570] sd 3:0:0:0: [sda] No Caching mode page present
[ 2081.332234] sd 3:0:0:0: [sda] Assuming drive cache: write through
[ 2081.338391] sd 3:0:0:0: [sda] Attached SCSI removable disk
```

```
# df
```

```
# df
Filesystem           1K-blocks      Used Available Use% Mounted on
rootfs                  302183    144137    142686  50% /
none                    247980         4    247976   0% /dev
/dev/mmcblk0p1         7838720    311328   7527392   4% /media/realroot
/dev/loop0              302183    144137    142686  50% /
/dev/mmcblk0p1         7838720    311328   7527392   4% /media/mmcblk0p1
tmpfs                   248960       124    248836   0% /var/volatile
tmpfs                   248960         0    248960   0% /media/ram
/dev/sda1               989148     74148    915000   7% /media/sda1
```

Unmounting USB storage device

```
# umount /media/sda1
```

3.10 3G

```
# ifconfig eth0 down
# ifconfig eth1 down
# pppd connect 'chat -v -s -t 10 "" "AT" "" "ATDT*99#" "CONNECT" ""'
user username password password /dev/ttyUSB2 460800 nodetach crtscts
debug usepeerdns defaultroute &
```

```
# pppd connect 'chat -v -s -t 10 "" "AT" "" "ATDT*99#" "CONNECT" ""' user username password password /dev/
ttyUSB2 460800 nodetach crtscts debug usepeerdns defaultroute &
[1] 1325
# send (AT^M)
send (ATDT*99#^M)
expect (CONNECT)
AT^M^M
OK^M
ATDT*99#^M^M
CONNECT
 -- got it

send (^M)
Script chat -v -s -t 10 "" "AT" "" "ATDT*99#" "CONNECT" "" finished (pid 1326), status = 0x0
Serial connection established.
using channel 2
Using interface ppp0
Connect: ppp0 <--> /dev/ttyUSB2
```

```
sent [LCP ConfReq id=0x1 <asyncmap 0x0> <magic 0x8a436f3c> <pcomp> <accomp>]
rcvd [LCP ConfReq id=0x3 <asyncmap 0x0> <auth chap MD5> <magic 0x1043349> <pcomp> <accomp>]
sent [LCP ConfAck id=0x3 <asyncmap 0x0> <auth chap MD5> <magic 0x1043349> <pcomp> <accomp>]
rcvd [LCP ConfAck id=0x1 <asyncmap 0x0> <magic 0x8a436f3c> <pcomp> <accomp>]
rcvd [LCP DiscReq id=0x4 magic=0x1043349]
rcvd [CHAP Challenge id=0x1 <6cd09e243c7585361ad2d3735ee48657>, name = "UMTS_CHAP_SRVR"]
sent [CHAP Response id=0x1 <606d8283832332d22b1503fc4408b650>, name = "username"]
rcvd [CHAP Success id=0x1 ""]
CHAP authentication succeeded
CHAP authentication succeeded
sent [CCP ConfReq id=0x1 <deflate 15> <deflate(old#) 15> <bsd v1 15>]
sent [IPCP ConfReq id=0x1 <compress VJ 0f 01> <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2 0.0.0.0>]
rcvd [LCP ProtRej id=0x5 80 fd 01 01 00 0f 1a 04 78 00 18 04 78 00 15 03 2f]
Protocol-Reject for 'Compression Control Protocol' (0x80fd) received
rcvd [IPCP ConfNak id=0x1 <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14> <ms-wins 10.11.12.13> <ms-wins 10.11
.12.14>]
sent [IPCP ConfReq id=0x2 <compress VJ 0f 01> <addr 0.0.0.0> <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14> <
ms-wins 10.11.12.13> <ms-wins 10.11.12.14>]
rcvd [IPCP ConfNak id=0x2 <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14> <ms-wins 10.11.12.13> <ms-wins 10.11
.12.14>]
sent [IPCP ConfReq id=0x3 <compress VJ 0f 01> <addr 0.0.0.0> <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14> <
ms-wins 10.11.12.13> <ms-wins 10.11.12.14>]
rcvd [IPCP ConfNak id=0x3 <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14> <ms-wins 10.11.12.13> <ms-wins 10.11
.12.14>]
sent [IPCP ConfReq id=0x4 <compress VJ 0f 01> <addr 0.0.0.0> <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14> <
ms-wins 10.11.12.13> <ms-wins 10.11.12.14>]
rcvd [IPCP ConfReq id=0x2]
sent [IPCP ConfNak id=0x2 <addr 0.0.0.0>]
rcvd [IPCP ConfRej id=0x4 <compress VJ 0f 01> <ms-wins 10.11.12.13> <ms-wins 10.11.12.14>]
sent [IPCP ConfReq id=0x5 <addr 0.0.0.0> <ms-dns1 10.11.12.13> <ms-dns2 10.11.12.14>]
rcvd [IPCP ConfReq id=0x3]
sent [IPCP ConfAck id=0x3]
rcvd [IPCP ConfNak id=0x5 <addr 100.67.33.244> <ms-dns1 168.95.1.1> <ms-dns2 168.95.192.1>]
sent [IPCP ConfReq id=0x6 <addr 100.67.33.244> <ms-dns1 168.95.1.1> <ms-dns2 168.95.192.1>]
rcvd [IPCP ConfAck id=0x6 <addr 100.67.33.244> <ms-dns1 168.95.1.1> <ms-dns2 168.95.192.1>]
Could not determine remote IP address: defaulting to 10.64.64.64
not replacing default route to eth1 [172.22.15.254]
local  IP address 100.67.33.244
remote IP address 10.64.64.64
primary   DNS address 168.95.1.1
secondary DNS address 168.95.192.1
Script /etc/ppp/ip-up started (pid 1329)
Script /etc/ppp/ip-up finished (pid 1329), status = 0x0
```

Checking if DNS is ready.

```
# cat /etc/resolv.conf
```

```
# cat /etc/resolv.conf
nameserver 168.95.1.1
nameserver 168.95.192.1
```

Testing if WiFi connection works or not.

```
# ping www.google.com
```

```
# ping www.google.com
PING www.google.com (64.233.189.99): 56 data bytes
64 bytes from 64.233.189.99: seq=0 ttl=45 time=6.137 ms
64 bytes from 64.233.189.99: seq=1 ttl=45 time=6.123 ms
64 bytes from 64.233.189.99: seq=2 ttl=45 time=6.115 ms
64 bytes from 64.233.189.99: seq=3 ttl=45 time=7.106 ms
64 bytes from 64.233.189.99: seq=4 ttl=45 time=6.155 ms
^C
--- www.google.com ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 6.115/6.327/7.106 ms
```

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